REMARKS

By the present amendment, claims 1 to 5 are pending in the application.

§112, ¶2

Claim 3 was rejected under 35 U.S.C. §112, second paragraph, as being indefinite.

In response to this rejection, claim 3 has been amended by the present amendment.

Claim 3 has been amended to specify --the steel pipe having been fabricated from a steel plate-- having the defined composition.

The location of the "30% or more" for the elongation has been changed to increase clarity.

In view of the present amendment, it is respectfully requested that the rejection of claim 3 under 35 U.S.C. §112, second paragraph, be withdrawn.

§102/§103

Claim 1 was rejected under 35 U.S.C. §102(b) as being anticipated by US 2003/0183292 to Otsuka et al. using U.S. Patent No. 6,851,455.

Claim 3 was rejected under 35 U.S.C. §103(a) as being unpatentable over US 2003/0183292 to Otsuka using U.S. Patent No. 6,851,455.

Claims 2 and 4 were rejected under 35 U.S.C. §103(a) as being unpatentable over US 2003/0183292 to Otsuka et al. using U.S. Patent No. 6,851,455 in view of Japan No. 2000-326079 to Hiroshi et al.

Claim 5 was rejected under 35 U.S.C. §103(a) as being unpatentable over US 2003/0183292 to Otsuka et al. using U.S. Patent No. 6,851,455 in view of Japan No. 2000-326079 to Hiroshi et al. and further in view of U.S. Patent No. 6,645,318 to Takahashi et al.

These rejections are respectfully traversed.

The Present Invention

A characteristic feature of the present invention is that a ferritic stainless steel welded pipe is superior in expandability, said ferritic stainless steel pipe containing, by wt %, C: 0.001 to 0.015%, Si: 0.01 to 1.0%, Mn: 0.01 to 1.0%, P: 0.01 to 0.03%, S: 0.005 to 0.010%, N: 0.001 to 0.020%, Cr: 11 to 25%, Mo: 0.01 to 2.0%, one or both of Ti and Nb in 0.05 to 0.5%, and B: 0.0003 to 0.0030% and the balance being Fe and unavoidable impurities, and after forming, welding, and sizing, a matrix of the welded pipe has an elongation in the circumferential direction of 15% or more.

Patentability

US 2003/0183292 (the " '292 patent") or (the "455 patent)

The technology disclosed in the '292 patent relates to a stainless steel oil feeding pipe having an elongation of 30% or more and Lankford value (r-value) of 1.2 or more in the rolling direction of the steel sheet material (usually pipe axis direction) and is an optimum material to be formed to a predetermined shape having a fuel-supply opening at its end without the occurrence of cracks or other defects. This means that these values of the stainless steel pipe are of the '292 patent are the values of the as-rolled state before forming, welding, and sizing for the welded pipe.

If the as-rolled optimum material of the '292 patent has applied strain by forming, welding and sizing, the value of the elongation of 30% or more and the Lankford value of 1.2 or more obtained by the '455 patent of '292 patent remarkably deteriorates, such as 20 - 30% worse as compared with the values of as-rolled state.

Therefore, the '292 patent or the '455 patent does not disclose or suggest the characteristic feature of the present invention that the ferritic stainless steel welded pipe has an elongation of 30% or more in the direction becoming the circumferential direction, and

having an average Lankford value (r value) of 1.5 or more. Further, even if the steel pipe compositions defined in claim 3 of the present invention are overlapped to those of the '292 patent, the required properties are completely different. Therefore, the '292 patent or '455 patent is different from the claims of the present invention.

Japan No. 2000-326079 (the " '079 patent")

The technology disclosed in the '079 patent relates to a ferritic stainless steel laser beam welded tube excellent in workability by reducing the hardness difference between a welded part and a base metal part, even after leveling. Further, the temperature, when a welded tube passes a straightening stand, is controlled to a temperature of 150°C or lower so that the hardness difference ΔHv (= HVW - HVB) between a Vickers hardness HVW of a welded part and a Vickers hardness HVB of a base metal part is in the range of 10 - 80 and the proof stress of the stock is 80% or higher than the room temperature proof stress. For this purpose, a sizer expansion machine having a hydraulic cylinder connected to the expansion tool to expand the pipe in six directions is used, and positions the welded part are at a gap of the expansion tool.

If the hardness difference between the welded part and a base metal of the '079 patent is more than 80, brittle cracks occur at the welded portion. However, there is no description in the '079 patent about the reasons for the lower limit of 10.

On the other hand, the present invention provides a very severe pipe forming in an eccentric expansion ratio of more than twice by a multi-step process by a punch. The welded pipe is compressed and deformed in the pipe axial direction due to the stress in the pipe axial direction caused by the friction with the punch in the different steps. The pipe of the present invention is expanded while receiving tensile deformation in the circumferential direction. Further, when accompanied with eccentric expansion, the eccentric part bulges out and tensile deformation is locally received in the axial direction and circumferential direction.

Further, when the balance in strength between the welded zone and the matrix of the welded pipe is not suitable, it leads to cracks.

As shown in Fig. 4 of the specification, when the welded zone is relatively low in strength with respect to the matrix, cracks occur in the weld zone in the axial direction (longitudinal direction). On the other hand, when the weld zone is too strong with respect to the matrix, the displacement of the weld zone in the pipe axial direction is smaller compared with the matrix, the weld zone sticks out at the ends of the expanded pipe, and the difference in displacement between the weld zone and the matrix in the pipe axial direction causes a larger shearing deformation between the two, and cracks occur in an inclined direction from the matrix near the weld zone.

The present invention targets to adjust the weld zone strength (hardness) in the multi-step expansion with a suitable balance of strength of the weld zone and the matrix and, in addition to the weld zone hardness, the weld zone bead thickness must be made in a suitable range. This is totally different from the '079 patent which aims to merely balance between the hardness difference between the weld zone and the matrix.

The present invention is different from the technology disclosed in the '079 patent in the points of (1) pipe expansion process and the pipe expansion ratio, (2) the upper limit of the hardness difference, and (3) cracks occurrence state.

One skilled in the art cannot arrive at the present inventive feature of the hardness difference of 10 - 40 and a ratio RT (= T_w / T_m) between a bead thickness T_w of the weld zone and a thickness T_m of the matrix is 1.05 to 1.3 as defined in claim 2 from the teaching of the hardness difference of 10 - 80 mentioned in the '079 patent. The '079 patent does not disclose or suggest the above mentioned present inventive features. Further, the '079 patent does not disclose and suggest the further inventive feature of annealing at 700 - 850°C after forming, welding and sizing defined in claim 5.

U.S. Patent No. 6,645,318 (the " '318 patent")

The '318 patent discloses a fuel tank made of ferritic stainless steel having long lasting corrosion resistance in the environment of a fuel tank and which is excellent in formability when fabricating the fuel tank. The ferritic stainless steel contains Cr: 10 - 25% and has an average r-value of 1.9 or more, an r-value in-plane anisotropy Δr of 1.0 or smaller, and a total elongation of 30% or more, and has a plane intensity ratio I (111) / I (100) or 10 or more, and further has lubricant film on the surface of the steel sheet and a surface friction coefficient of 0.10 or less. See Abstract of '318 patent.

The '318 patent discloses that the stainless steel sheet to be formed into a pipe or to be fabricated into a tank is annealed at 800 - 1150°C for recovering elongation.

However, the annealing at 700 - 850°C in the present invention is aimed at preventing cracks during the multi-step pipe expansion for securing the present invention feature of the hardness difference of 10 - 40 and a ratio RT (= T_w / T_m) between a bead thickness T_w of the weld zone and a thickness T_m of the matrix is 1.05 to 1.3.

Therefore, the technology disclosed or suggested in the '318 patent is different from the present invention.

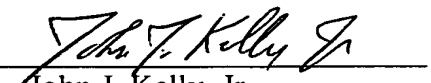
It is therefore submitted that independent claim 1 and claim 2, and all claims dependent thereon, are patentable over the '292 patent (the '455 patent) and/or the '079 patent and/or the '318 patent standing alone or in combination.

CONCLUSION

It is submitted that in view of the present amendment and foregoing remarks, the application is now in condition for allowance. It is therefore respectfully requested that the application, as amended, be allowed and passed for issue.

Respectfully submitted,

KENYON & KENYON

By: 
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